

Development and Evaluation of Mixed Uranium-Refractory Carbide/Refractory Carbide Cer-Cer Fuels, Phase II

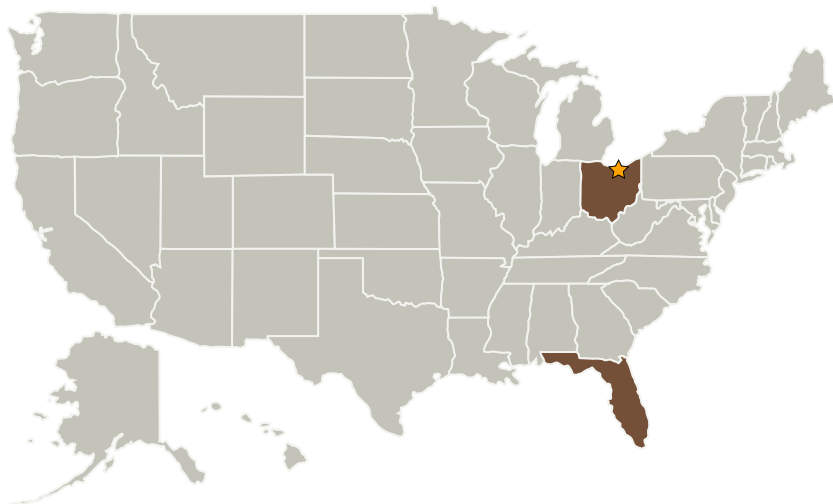
Completed Technology Project (2006 - 2008)



Project Introduction

In this proposal a new carbide-based fuel is introduced with outstanding potential to eliminate the loss of uranium, minimizes the loss of uranium, and retains fission products for many hours of operation in hydrogen environment at temperatures in excess of 3,200K. The proposed fuel is a ceramic-ceramic (CerCer) composite of mixed uranium-refractory carbides such as (U, Zr)C or (U, Zr, Nb)C in a matrix of refractory carbides that mostly include transition metal carbides such as ZrC, NbC, TaC, and HfC. Due to its low neutron absorption cross-section, ZrC is the primary refractory carbide of choice. Replacing ZrC with higher temperature refractory carbides such as TaC and HfC could further improves the high temperature performance of CerCer fuels. However, higher neutron absorption cross-section penalty for Ta and Hf could potentially offset the performance enhancement gain. Due to complete containment and encapsulation of mixed uranium carbide in zirconium carbide matrix, the proposed CerCer fuel could be conveniently fabricated to different geometrical shapes such as solid block prismatic, twisted ribbon, pebbles, wafer, or square lattice honeycomb. Considering the operational parameters for the NT/BP systems, it is reasonable to argue that the proposed CerCer fuel concept could set the upper material performance limits while providing more flexibility in the geometrical design of the fuel.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
New Era Technology	Supporting Organization	Industry	Gainesville, Florida

Primary U.S. Work Locations	
Florida	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.5 Hybrids